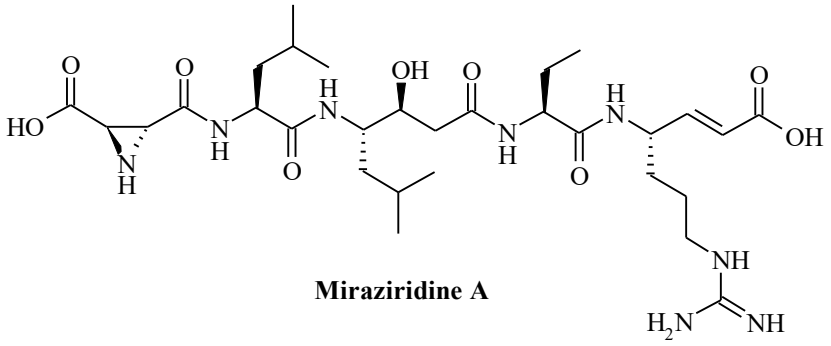
Aziridines as antiviral agents – the potential research field

Compounds containing aziridine ring in their structures are known as highly reactive chemical substances, due to the nature of the small, constrained aziridine ring. This reactivity determines some biological activity of aziridine compounds, such as well-known antitumour (imexon, azimexon [1], leakadine [2], mitomycin C [3]) and antibacterial (ficellomycin [4]) activity. For the same reason aziridines as well as other small heterocycles are common intermediates and building blocks in the synthesis of complex molecules.

This chemical activity of aziridines, especially electrophilic nature of aziridine ring allows to predict some interesting activity towards virus-type targets.

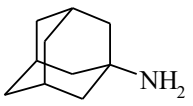
A short analysis of the available literature shows some examples of potential antiviral compound studies in small heterocycles including aziridines. First, aziridine-2.3-dicarboxylate moiety containing pentapeptide Miraziridine A has been isolated from marine sponge *Theonella mirabilis* [5].



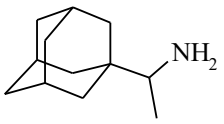
Miraziridine A

Miraziridine A is known as cysteine protease inhibitor and hypothetically can simultaneously block serine, cysteine and aspartyl protease activity. At the same time, it is known that HIV-1 protease is a retroviral aspartyl protease and many antiretroviral HIV-1 protease inhibitors (Lopinavir, Ritonavir, Darunavir etc.) represent a class of drugs used to treat HIV/AIDS and hepatitis C.

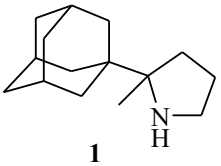
The other class of studied potential antiviral compounds are substituted adamantanes – analogues of Amantadine and Rimantadine.



Amantadine



Rimantadine



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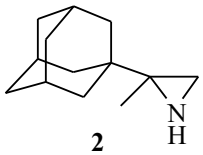

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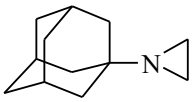

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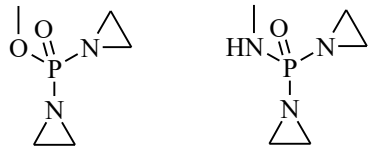
Heterocyclic Rimantadine analogues **1** and **2** have been examined against influenza A H2N2 virus and authors found that structure **1** was 9-fold more potent than

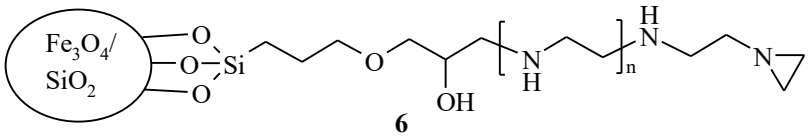
Rimantadine and 27-fold more potent than amantadine, structure **2** shows a moderate/ borderline activity [6] and structure **3** has been patented as antiviral compound by du Pont de Nemours [7].



4 **5**

Acylated phospinate aziridines **4** [8] and **5**[9] exhibit antiviral properties, especially against encephalitis virus.

An interesting new topic is the development of aziridine containing virucidal ferromagnetic nanoparticles for selective cell targeting, detection and drug delivery systems [10]. The particles functionalized with biguanide or aziridine moieties (structure **6**) are able to bind and inactivate bacteriophage MS2, herpes simplex virus HSP-1, non-enveloped infectious pancreatic necrosis virus and enveloped viral hemorrhagic septicaemia virus thus providing amethod for the magnet-based virus removal.



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Summarizing it is possible to conclude that only sporadic results of aziridine compounds antiviral activity are present in the literature. On the other hand, biological activity of various aziridine derivatives is well-known, therefore antiviral aziridines is an open promising research field.

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